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# (54) MANUFACTURING AND ACCESSING METHODS OF COPYING PREVENTED OPTICAL RECORDING MEDIUM AND THE MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent an unauthorized copying by recording the information data, which select block numbers and addresses for a copying prevention,

convert them into a copying prevention key and protect the key, with the copying prevention key on an optical recording medium.

SOLUTION: Addresses corresponding to arbitrary number subcode Q fields are defined and used as independent identifies to identify all authorized recording media. The address of a selected subcode Q field is converted into a copying prevention key, a ciphering is conducted by using the key, an extraction and ciphering reading program is added and recorded. The program reads the accessed data by employing the extracted copying prevention key. Then, a discrimination is made by determining whether an original copying prevetion key and the extracted copying prevention key are agreed to each other or not. If they agree with each other, a reading is normally conducted, an application is loaded and executed. If they do not agree with each other, the application is not read and a process is terminated.

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CLAIMS

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[Claim(s)]
[Claim 1] In the manufacture of an optical recording medium which has information in a different block and by which anti-copying was carried out The step which chooses the number and the address of the block for anti-copying, The step which changes into an anti-copying key the number and the address of the block by which selection was made [ above-mentioned ], The step which records the information data to protect on an optical recording medium with the above-mentioned anti-copying key, The step which manufactures the master which has the sub-code field where the block by which selection was made [ above-mentioned ] was changed, and the sub-code field of other blocks, The manufacture approach of the optical recording medium by which anti-copying was carried out of having the step which reproduces the above-mentioned optical recording medium using the master by which manufacture was carried out [ above-mentioned ].
[Claim 2] The step which records the above-mentioned information data which carry out protection on the above-mentioned optical recording medium The step which enciphers selectively at least the data recorded with the above-mentioned anti-copying key, Have the ** step which gives the program which decodes an extract and a code to the data by which encryption was carried out [ above-mentioned ], and the above-mentioned program which carries out an extract The program which finds out the block which has the sub-code information by which a change was made [ above-mentioned ], extracts the above-mentioned anti-copying key from this block, and decodes the above-mentioned code The manufacture approach of the optical recording medium according to claim 1 which is characterized by decoding the information by which encryption was carried out [ above-mentioned ] based on the above-mentioned anti-copying key extracted from the above-mentioned program

which carries out an extract when it performs and by which anti-copying was carried out.

[Claim 3] The step which records the above-mentioned information data which carry out protection on the above-mentioned optical recording medium Have the ** step which gives the program extracted and compared to the above-mentioned information data, and the ** step which gives the above-mentioned anti-copying key to the above-mentioned information data, and the above-mentioned program which carries out an extract Find out the above-mentioned block which has the sub-code information by which a change was made [ above-mentioned ], extract the above-mentioned anti-copying key from this block, and the above-mentioned program which carries out a comparison When it performs, the anti-copying key by which with was carried out [ above-mentioned ] to the anti-copying key by which the extract was carried out [ above-mentioned ] is compared. The manufacture approach of the optical recording medium according to claim 1 which is characterized by not permitting access to the above-mentioned information data selectively at least based on correlation of the above-mentioned mutual anti-copying key and by which anti-copying was carried out.

[Claim 4] The sub-code field by which a change was made [ above-mentioned ] is the manufacture approach of the optical recording medium according to claim 1 to 3 which is characterized by being changed so that it may be recognized as not regular with a regenerative apparatus and by which anti-copying was carried out.

[Claim 5] The sub-code field by which a change was made [ above-mentioned ] is the manufacture approach of the optical recording medium according to claim 1 to 4 which is characterized by being made so that the address information which is not regular may be included excluding address information and by which anti-copying was carried out.

[Claim 6] The sub-code field by which a change was made [ above-mentioned ] is the manufacture approach of the optical recording medium according to claim 1 to 5 which is characterized by being the sub-code Q field and by which anti-copying was carried out.

[Claim 7] It is the manufacture approach of the optical recording medium according to claim 1 to 6 which the above-mentioned optical recording medium is a compact disk, and is characterized by the above-mentioned information being audio data which have control data and information data and by which anti-copying was carried out.

[Claim 8] It is the manufacture approach of the optical recording medium according to claim 1 to 6 which is characterized by for the above-mentioned optical recording

medium being the read-only memory of a compact disk, and the above-mentioned information being the digital data of one of formats and by which anti-copying was carried out.

[Claim 9] How to access the step which finds out the block which has the changed sub-code field which corresponds to a different block in access to the optical recording medium which has information, and by which anti-copying was carried out, the step extract an anti-copying key from the pattern of the block which has the changed corresponding sub-code field which was found out the account of a top, and the step search data from an optical recording medium according to the anti-copying key by which an extract was carried out [ above-mentioned ] to the optical recording medium [ have ] by which anti-copying be carried out.

[Claim 10] The step which finds out the block which has the changed above-mentioned sub-code field which carries out a response is the approach of accessing the optical recording medium according to claim 9 which is characterized by finding out the block which has the changed corresponding sub-code Q field and by which anti-copying was carried out.

[Claim 11] The step which finds out the block which has the changed above-mentioned sub-code field which carries out a response By accessing at a delivery predetermined block, each command to the optical pickup of a regenerative apparatus The step which accesses a predetermined block based on the address decided in the above-mentioned sub-code Q field of the above-mentioned block, By checking the block address or the Maine code data decided immediately after access processing of an optical pickup in the above-mentioned sub-code Q field The step which judges whether the above-mentioned optical pickup accessed the above-mentioned predetermined block, How to access the optical recording medium according to claim 9 or 10 which is characterized by having the step which memorizes all the block addresses of the block which was not able to carry out direct access of the above-mentioned optical pickup and by which anti-copying was carried out.

[Claim 12] The step which memorizes all the block addresses of the block which was not able to carry out direct access of the above-mentioned optical pickup In the step which has further the step which memorizes all the block addresses of the block which was able to carry out direct access of the above-mentioned optical pickup, and extracts the above-mentioned anti-copying key The above-mentioned anti-copying key is the approach of accessing the optical recording medium according to claim 11 which is characterized by being extracted from the pattern which has the changed above-mentioned sub-code field which carries out a response, and the pattern which

has the corresponding sub-code field which is not changed and by which anti-copying was carried out.

[Claim 13] The step which searches data from the above-mentioned optical recording medium is the approach of accessing the optical recording medium according to claim 9 to 12 which is characterized by having the step which decodes the code of the searched data which have the anti-copying key extracted at the step which extracts the above-mentioned anti-copying key and by which anti-copying was carried out.

[Claim 14] The step which searches data from the above-mentioned optical recording medium The step which compares the anti-copying key extracted at the step which extracts the above-mentioned anti-copying key with the anti-copying key given to the information recorded on the optical recording medium, or [ not permitting access to the above-mentioned information data selectively at least based on correlation of the above-mentioned mutual anti-copying key ] -- or the approach of accessing the optical recording medium according to claim 9 to 13 which is characterized by having the step which is not permitted at all and by which anti-copying was carried out.

[Claim 15] or [ that the step which searches data from the above-mentioned optical recording medium does not permit access to the above-mentioned information data selectively at least based on correlation of the step which compares the anti-copying key extracted at the step which extracts the anti-copying key searched at the time of the above-mentioned data retrieval, and the above-mentioned anti-copying key, and the above-mentioned mutual anti-copying key ] -- or the approach of accessing the optical recording medium according to claim 9 to 14 which is characterized by not to grant a permission at all and by which anti-copying was carried out.

[Claim 16] The step which searches the above-mentioned data is the approach of accessing the optical recording medium according to claim 9 to 15 which is characterized by being carried out by the software installed by the above-mentioned optical recording medium and by which anti-copying was carried out.

[Claim 17] The optical recording medium which has information in a block which the sub-code field of the original accessible block in a predetermined pattern is changed, and is different and by which anti-copying was carried out.

[Claim 18] The sub-code field by which a change was made [ above-mentioned ] is an optical recording medium according to claim 17 which is characterized by not being regular and by which anti-copying was carried out.

[Claim 19] The sub-code field by which a change was made [ above-mentioned ] is the optical recording medium with which anti-copying of the claim 17 characterized by being the sub-code Q field or the 18 term publication was carried out.

[Claim 20] the claim 17 characterized by for the above-mentioned optical recording medium being a compact disk, and the above-mentioned information being audio data which have control data and information data -- moreover -- or the optical recording medium with which anti-copying of the 19 term publication was carried out.
[Claim 21] the claim 17 characterized by for the above-mentioned optical recording medium being the read-only memory of a compact disk, and the above-mentioned information being the digital data of one of formats -- moreover -- or the optical recording medium with which anti-copying of the 19 term publication was carried out.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the field of CD including all the formats that will exist existing and in the future [ of the compact disk for audios (henceforth CD), or CD-ROM ], and the format of the combination which will exist existing and in the future [ of CD or the optical recording medium (support) of other classes ]. Especially, this invention relates to the approach of manufacturing the optical recording medium in which anti-copying was carried out by authentication about anti-copying and the approach of carrying out copy control in the optical recording medium, the approach of accessing the optical recording medium by which anti-copying was carried out, and the optical recording medium by which anti-copying

was carried out.

[0002]

[Description of the Prior Art] The optical disk with which information was recorded on one side or both sides is used for record of various applications, for example, music information, a game program, image information, etc., the storage of a computer, etc. Digital information is recorded as a pit configuration arranged on the truck of concentric circular or a curled form established in one side or both sides of an optical disk. Although a truck is usually read toward a periphery from inner circumference, it is read toward inner circumference from a periphery with some optical recording media. The data on a truck are divided into the sector, each sector has the same die length and the same amount of information is recorded.

[0003] In order to manufacture an optical recording medium, for example, CD, after applying a photoresist to the glass negative of CD, a photoresist is exposed by the modulated laser beam (cutting). The modulation of a laser beam is performed based on the digital information recorded on CD of a product. Then, negatives are developed (etching), and two or more crevices where the exposed spot configuration is small are arranged and formed on a glass negative at one curled form. The pattern and die length of a crevice which were formed on this truck support the information by which digital recording is carried out. And by electrocasting, a nickel metal is deposited on a glass negative, this nickel layer is exfoliated, and a nickel master is usually manufactured. Similarly, electrocasting and exfoliation processing are repeated twice and sequential production of the so-called mother nickel and La Stampa is carried out. And La Stampa is attached in metal mold, with injection molding, the front face of the base made of a polycarbonate or polymethacrylate (PMMA) resin is embossed, and the base of an optical disk is produced. And a protective coat is formed in order to prevent oxidation of this reflecting layer, after coating a disk base with aluminum or gold and forming a reflecting layer.

[0004] Drawing 5 shows the pattern of the pit 2 formed in the poly kaavie NETO substrate 1 of this optical disk, and a land 3. A reflecting layer 4 is on the poly kaavie NETO substrate 1 with which the pit 2 and the land 3 were formed, and a laser beam is irradiated through this reflecting layer 4.

[0005] Drawing 6 is a mimetic diagram for explaining the principle which reads data from CD. A laser beam is irradiated so that a focus may be connected to a disk front face. If a laser beam is irradiated on the field of a land 3, most laser beams will be reflected. On the other hand, if a laser beam is irradiated by the field of a pit 2, laser beams will be diffracted and scattered about and only a very little laser beam will be

reflected in the direction of an optical axis. By this, the read-out circuit of CD regenerative apparatus can detect the difference between the information on "0", i.e., a "low level", and the information on "1", i.e., "high level", and a read-out circuit can reproduce the information currently recorded on CD by this.

[0006] As the storage of the read only of a computer, for example, a CD-ROM, although the original object that CD was developed was for playback of audio information, as a result of Audio's CD spreading and coming to be manufactured by the large quantity, a manufacturing cost falls and it has come to be used in recent years.

[0007] The format of the audio information recorded on CD is prescribed by "Red Book." By the specification of Red Book, the digital data on CD is divided and recorded on the truck, and is identified per truck. As shown in drawing 8 , while the digital sampled value of an audio channel on either side is interleaved, the so-called error correcting code and so-called sub-code of C1 and C2 are added, and CD block is constituted. The sub-code information which covered the entire disk and was interleaved has specified the present location to both the present truck and an entire disk with the part, the second, and the frame.

[0008] The format of CD-ROM is prescribed by the so-called "yellow book." The format of a yellow book is the same as a format of Red Book in the interleave using how to use the data divided into the truck for audio data except having transposed to computer data, and an error correcting code, and almost all parts including a sub-code. Many specification about the optical recording medium which records that in which audio data, computer data, image data, and these data were intermingled exists besides the specification of Red Book or an Orange Book.

[0009] In such specification, it can be necessary to access all blocks of CD.

[0010] Drawing 7 is drawing showing a format of the data sector in the mode 1 of Standard C D-ROM, and 1 data sector consists of 12 bytes of Maine code synchronous field (maincode synchronization field), 3 bytes of address, 1 byte of mode, 2048 bytes of user data, 4 bytes of error detecting code, 8 bytes of 0, and 276 bytes of an error correcting code. The data sector in CD-ROM, i.e., CD block, and a block consist of 2352 bytes, and is equivalent to 1 / 75 seconds.

[0011] 2352 bytes of 1 data sector are divided into 98 frames as shown in drawing 8 , and 24 bytes of a data sector are contained in each frame. Furthermore, 4 bytes of C2 error correcting code, 4 bytes of C1 error correcting code, and 1 byte of sub-code are contained in each frame. As 1 byte of this sub-code is similarly shown in drawing 8 , it is divided into eight sub-code channels, and each is called Sub-codes P, Q, R, S, T, U,

and V and W field. Each sub-code channel consists of 98 bits which consists of two sync bits and 96 data bits.

[0012] Here, Q sub-codes which consist of 98 bits are also called the sub-code Q field by this invention. The sub-codes P, R, S, T, U, V, and W for other information are also made the same. As shown in drawing 9 , the 2-bit sub-code alignment patterns S0 and S1 are formed, and these patterns are used for the head of each sub-code channel as a synchronizing signal for rotating CD with a fixed linear velocity with CD regenerative apparatus.

[0013] Each sub-code channel has a different function and the different content. Here, Q channels of a sub-code are explained.

[0014] It is used as control field, and 4 bits of classes of information on a truck following the alignment pattern of a sub-code are shown as shown in the following table 1.

[0015]

[A table 1]

| サブコードQフィールド | 説明 |
|---|---|
| ００×０ | プリエンファシス無しの２オーディオチャンネル |
| ００×１ | ５０／１５μ秒のプリエンファシスを有する２オーディオチャンネル |
| １０×０ | プリエンファシス無しの４オーディオチャンネル |
| ００×１ | ６０／１５μ秒のプリエンファシスを有する２オーディオチャンネル |
| ０１×０ | データトラック（ＣＤ－ＲＯＭ） |
| ０１×０ | 逆 |
| １１×× | 逆 |
| ××０× | ディジタルコピー禁止 |
| ××１× | ディジタルコピー許可 |

[0016] It was used as an address field and 4 bits of modes following control field are specified. Although there are the modes 1 and 2 and two or more modes of 3 grades as mode, this example explains only the mode 1 to a detail.

[0017] Two different data formats can be used in the mode 1. This example explains the content of Q channels and lead-out field of a sub-code which are shown in

drawing 9 .

[0018] TNO which consists of 8 bits is the track number of 0-99. As for the truck of AA, the number shows the lead-out truck.

[0019] X which consists of 8 bits is an index number in a truck, and takes the value of 0-99.

[0020] The MIN field, the SEC field, and the FRAME field consist of 8 bits, respectively, and show the elapsed time in a truck by BCD of six digits. The part of a truck is memorized in the MIN field, a second is memorized in the SEC field, and a frame is memorized in the FRAME field. In addition, it consists of 75 frames (0-74) for 1 second.

[0021] All of 8 bits of Zero are set as 0.

[0022] The AMIN field, the ASEC field, and the AFRAME field consist of 8 bits, respectively, and show the absolute elapsed time in a disk by BCD of six digits. Absolutely, the part of elapsed time is memorized in the MIN field, a second is memorized in the SEC field, and a frame is memorized in the FRAME field. In addition, it consists of 75 frames (0-74) for 1 second.

[0023] CRC is the 16-bit cyclic code error detecting code to control field, an address field, the TNO field, X field, the MIN field, the SEC field, the FRAME field, the Zero field, the AMIN field, the ASEC field, and the AFRANE field. The parity bit on a disk serves as reverse. CRC is calculated by the following polynomial and it is judged whether a remainder is 0.

[0024] P(x) =x16+x12+x5+1 -- this 16-bit CRC field is the parity information for detecting the error of each field of control, the address, TNO, X, MIN and SEC, FRAME, Zero, AMIN, ASEC, and AFRANE.

[0025] Although there is a big advantage in CD-ROM, there are some faults in the point of marketability, mass selling, and an expensive software package. It may be said that there is no clear method of preventing the copy of current CD-ROM as one of the serious faults. The content of the CD-ROM will be copied to a hard disk drive unit or direct, for example, CD-R etc., CD which can be written in by current. If a software package is unjustly copied to the hard disk drive unit of CD-R or a computer, the software will operate satisfactory technically.

[0026] This invention is offering the method of being offering the approach of it having been made in view of such the actual condition, and preventing the copy of the original optical recording medium, and attaching and manufacturing the anti-copying key which carries out the copy to other optical recording media by not being made on the original optical recording medium in order to enable it to distinguish the original optical recording medium and the copied optical recording medium especially, and the method

of decoding the anti-copying key of the original optical recording medium. Moreover, the object of this invention is offering the optical recording medium by which anti-copying's was carried out.

[0027]

[Means for Solving the Problem] The manufacture approach of the optical recording medium by which anti-copying was carried out of having information in a different block concerning this invention The step which chooses the number and the address of the block for anti-copying, The step which changes the selected number and the selected address of a block into an anti-copying key, The step which records the information data to protect on an optical recording medium with an anti-copying key, It has the step which manufactures the master which has the sub-code field where the selected block was changed, and the sub-code field of other blocks, and the step which reproduces an optical recording medium using the manufactured master.

[0028] The approach of accessing the optical recording medium which has information in the different block concerning this invention and by which anti-copying was carried out has the step which finds out the block a block has the sub-code field the field corresponds, and the field was changed, the step of the block which has the sub-code field the field was found out, the field corresponds, and the field was changed which extract an anti-copying key from a pattern, and the step which search data from an optical recording medium according to the extracted anti-copying key.

[0029] The optical recording medium which has information in a different block concerning this invention and by which anti-copying was carried out has the sub-code information for which the sub-code field of the original accessible block in a predetermined pattern was changed.

[0030] The drawing in this description is used in order to explain the example of this invention. The principle of this invention is explained in detailed explanation of this invention shown in general explanation of this invention mentioned above and the following.

[0031]

[Embodiment of the Invention] This invention relates to the approach of producing CD which has an original identifier. This original identifier is obtained by generating the block which has the changed sub-code Q field in a predetermined pattern, and is called a key or a fingerprint. This approach of producing CD is also applicable to mass production method. The following concrete examples explain further the method of searching this identifier, and the computer by which the CD-ROM regenerative apparatus was attached.

[0032] In the concrete example of this invention, the data with which the anti-copying key was given to CD are recordable by continuing and changing the sub-code Q field of a certain amount into the program area of CD. Consequently, modification of these sub-code Q fields serves as the sub-code Q field which is not regular. On the other hand, since the address is recorded in the Maine code header as shown in drawing 9 , access to the block of CD corresponding to the sub-code Q field which is not regular is possible.

[0033] Furthermore, after this invention enciphers a part of Maine application recorded on CD, or data file [ at least ] and searches the anti-copying key in CD to accuracy, it decodes the code of the area where it was used as an instrument for decryption of an anti-copying key, and at least the part was enciphered.

[0034] Furthermore, this invention searches the single or two or more anti-copying keys on CD with the modification pattern of various sub-code Q fields.

[0035] Before the predetermined pattern of the block which has the sub-code information for which the main advantages for a user were changed is produced, it is known, and since it is also possible to perform in the data recorded on each record medium, an anti-copying key does not need to be inputted between the authentication processes of the optical recording medium by which anti-copying was carried out. Combination with the key of the exterior with the need of being inputted by the user during access unlocks only the part with CD from the original disk. Possibility of producing many language versions left and recorded from a disk or the software package upgraded to some extent origin it pays at the time of unlocking by this is given.

[0036] Hereafter, the manufacture approach of the optical recording medium concerning this invention by which anti-copying was carried out, the approach of accessing the optical recording medium by which anti-copying was carried out, and the optical recording medium by which anti-copying was carried out are explained to a detail, referring to a drawing.

[0037] How to begin to extract or read the approach of generating a key or a fingerprint original on an optical recording medium, for example, optical recording media, such as CD, and this key, or a fingerprint, and to decode it is explained.

[0038] The main data of each sector of CD-ROM are associated and recorded on Q sub-codes or the sub-code Q field which includes the original address (a minute, a second, frame) for every sector, as mentioned above. CD-ROM for 60 minutes includes 270000 sectors and the 270000 sub-code Q fields.

[0039] The predetermined pattern of the sub-code Q field which is not regular, for

example, the sub-code Q field which has the address which is not regular, can be used as an own original identifier of a disk from the sub-code Q field usually being reproduced in the process of a copy. The equipment which accesses a disk, for example, a CD-ROM regenerative apparatus, can identify the block which has the sub-code Q field which is not regular, and the block which has the sub-code Q field of normal, i.e., the sub-code Q field which has the address of normal. Therefore, a CD-ROM regenerative apparatus reproduces this block again, when the block which has the sub-code Q field which is not regular is accessed. Since the equipment which can produce the copy of an optical disk easily on the other hand does not copy the sub-code Q field of the original optical disk to other optical disks directly but the sub-code Q field of the normal reproduced in the process of a copy is copied, the sub-code Q field which is not regular is not copied. Therefore, the optical disk copied unjustly will have only the sub-code Q field of normal, and can identify the optical disk copied by this with the original optical disk.

[0040] As shown in drawing 9 , it the address of a block is not only recorded on the corresponding sub-code Q field, but is recorded on the Maine code header. The optical disk which can access all blocks with those addresses recorded on the Maine code header at least, and has the sub-code Q field which is not regular is based on specification, such as a yellow book of CD-ROM.

[0041] In case a CD-ROM regenerative apparatus reads data (information) from the sector of CD, generally, it is scanned along a truck and decodes the address data of the sub-code Q field. ****** and the firmware of a CD-ROM regenerative apparatus decode the address data of the Maine code header to the detected address, and return them to it at the application which read the data of this sector.

[0042] Moreover, the location of the optical pickup of a CD-ROM regenerative apparatus can seek a certain address, and can obtain it by asking and making the location of an optical pickup a CD-ROM regenerative apparatus. Before returning the sub-code Q field to the read application, the firmware of a regenerative apparatus re-calculates the CRC field of the sub-code Q field, and verifies the content of the remaining cutting tools of the sub-code Q field. When there is no error in the sub-code Q field re-calculated and verified, a CD-ROM regenerative apparatus returns the sub-code Q field where an inquiry was. When not in agreement with 16-bit CRC by which the re-calculated 16-bit CRC field is recorded on the optical disk, a CD-ROM regenerative apparatus does not return the sub-code Q field where an inquiry was. Although it is dependent also on the strategy of a CD-ROM regenerative apparatus, as for the front stirrup of the block including the sub-code Q field with an

error, i.e., the sub-code Q field which is not regular, a next single or the content of the sub-code Q field of two or more blocks is returned.

[0043] Retrieval of modification of the sub-code Q field on an optical disk is performed by the circuit or software of dedication. In the example of this invention, a program seeks a certain address which includes at least all the addresses that became less regular by changing the sub-code Q field at a mastering process. Although it is dependent also on the strategy of a CD-ROM regenerative apparatus, when a CD-ROM regenerative apparatus tries access of the block which has the address which is not regular in the sub-code Q field, the front stirrup of the block with an error returns a next single or two or more blocks.

[0044] Drawing 1 is drawing showing distribution of the block reproduced when the sub-code Q field which is not regular is accessed with various CD-ROM regenerative apparatus. Here, surrounding distribution of the sub-code Q field which is not regular is the Gaussian distribution which has a gap in the location of the sub-code Q field which is not regular.

[0045] On the other hand, drawing 2 is drawing showing distribution of the block reproduced when the sub-code Q field of normal is accessed with various CD-ROM regenerative apparatus. Here, surrounding distribution of the sub-code Q field which is not regular is the Gaussian distribution which does not have a gap in the location of the sub-code Q field which is not regular.

[0046] As shown in drawing 1 and drawing 2 , returned value (the number of the sub-code Q fields) differs from a CD-ROM regenerative apparatus in the time of seeking the sub-code Q field which is not regular, and the time of seeking the sub-code Q field of normal. It becomes the difference in this returned value, and the anti-copying key by which the location of this difference is further extracted from an optical disk.

[0047] Drawing 3 is a flow chart which shows the process which CD by which anti-copying was carried out based on the manufacture approach of the optical recording medium concerning this invention by which anti-copying was carried out reproduces.

[0048] In step 1, the address corresponding to the sub-code Q field and its sub-code Q field of a number of CD is defined freely. [ of arbitration ] These sub-code Q fields can be used as an original identifier for identifying the record medium (support) of all the normal of this CD. These defined sub-code Q fields are changed behind, and are changed into the sub-code Q field which is not regular. The typical range of the changed sub-code Q field in this example is 6-60. These change is made at a

mastering process. In addition, you may make it change the sub-code Q field beforehand by the software program.

[0049] In step S2, the address of the sub-code Q field chosen at step S1 is changed into an anti-copying key.

[0050] In step S3, using this anti-copying key, data, such as an application program and user data, are recorded on a disk, namely, it enciphers.

[0051] In step S4, an extract and a decryption program are attached and recorded on the enciphered data.

[0052] In addition, the data enciphered using the extract and the decryption program at the time of playback of CD are decoded, and it enables it to access data even if a user does not do special actuation. Then, an extract and a decryption program scan a disk, in order to find the sub-code Q field which is not regular at least, and they extract an anti-copying key. In addition, the anti-copying key may be based on the combination of the sub-code Q field of normal, and the sub-code Q field which is not regular. An extract and a decryption program decode the data accessed using the extracted anti-copying key.

[0053] In the mastering process of step S5, by the laser beam modulated with data, a photoresist is exposed and all the modification of the sub-code Q field is imprinted to a glass master.

[0054] In the process of reproduction of step S6, CD is embossed using La Stampa by which modification of the sub-code Q field was imprinted by accuracy. Before the number and the address of the sub-code Q field which are not regular manufacture a glass master, it gets down from a solution, and since it is incorporable into the data recorded on a disk, modification of the sub-code Q field, i.e., the sub-code Q field which is not regular, can be used as the original key or fingerprint of each CD.

[0055] In addition, the data recorded on the disk at the time of playback of CD-ROM can be accessed at data, when it is an anti-copying key based on the sub-code Q field whose key currently recorded on the disk as data is not regular, or only when the data currently recorded on the disk using the anti-copying key extracted from the disk are decoded.

[0056] Any standard codes can be used as a code of the application used by the manufacture approach of the optical recording medium which was mentioned above, and by which anti-copying was carried out. There are various cipher systems and approaches, for example, cutting tool substitution, WORD substitution, a multi-term function of a 2-byte array that consists of a cutting tool array showing the cutting tool array showing a user's application and a key. An application program is enciphered

completely selectively. When enciphering selectively, 4 bytes per 2048 bytes are enciphered. Moreover, some different cipher systems or keys can also be used for the part from which the application program currently recorded on the optical recording medium differs.

[0057] Drawing 4 is a flow chart which shows actuation when the application and the disk by which anti-copying was carried out based on the manufacture approach of the optical recording medium concerning this invention by which anti-copying was carried out are performed by computer.

[0058] In step S11, CD-ROM by which anti-copying was carried out is inserted in a CD-ROM regenerative apparatus.

[0059] The scan of CD-ROM is started in step S12.

[0060] In step S13, the sub-code Q field which is not predetermined normal is searched at least. In this example, in order to judge whether it is the sub-code Q field of normal, or it is the sub-code Q field which is not regular, the block of the predetermined number which has the predetermined address is verified. Based on the result returned from a CD-ROM regenerative apparatus, it checks whether direct access is possible for a predetermined block. These results are memorized as a list. This list consists of a predetermined block and a result of having corresponded to each.

[0061] In step S14, once the scan of the predetermined sub-code Q field is completed, it will extract based on the list which memorized the anti-copying key in step S13. When the anti-copying key of the sub-code Q field which is not predetermined normal is extracted at least, the fingerprint or the original anti-copying key of CD can be reproduced. This anti-copying key is used from the first, in case application is enciphered selectively or thoroughly.

[0062] In step S15, the enciphered application is decoded using this anti-copying key.

[0063] In step S16, it judges whether the original anti-copying key and the extracted anti-copying key are in agreement, and when in agreement, while decode is performed normally and application is loaded in step 17, it performs.

[0064] Although decode of application is tried in step 18 using a different anti-copying key from the original anti-copying key when the anti-copying key extracted from different CD from the original disk on the other hand differs from the original anti-copying key, since application is not decoded, it cannot be performed but ends processing.

[0065] The optical recording medium concerning this invention by which anti-copying was carried out is recordable with any data, limits the class of data recorded specially,

or does not limit the amount of data.

[0066] This invention is not limited to much what kind of special format, i.e., the audio data, the computer data, the video datas, or such combination of an optical recording medium of a class, either, but can be applied to all existing optical-recording-medium formats.

[0067]

[Effect of the Invention] As shown by detailed explanation of this invention mentioned above, a CD-ROM regenerative apparatus returns a different result, when it is a sector, i.e., normal, or the block which has the sub-code Q field which is not regular is searched. The anti-copying key extracted in order to decode the code of a part in which the Maine application is enciphered based on the difference among these results is used. If it will put in another way supposing decode of this code is performed by the anti-copying key of normal by searching from the original disk, supposing decode of a code will be performed using the same anti-copying key as the anti-copying key used when enciphering application, the Maine application will work appropriately on the computer platform which was fully memorized by the general layout, for this reason was designed. It becomes a different anti-copying key from the anti-copying key currently used till then for encryption to search an anti-copying key from the disk which is not the original disk or the sub-code Q field was not normally copied to another disk as Maine code data, but was newly generated and was copied in the process of a copy from one disk, and it brings a process of further different decryption, and a result of decryption. Therefore, it becomes impossible to decode such a code on the computer platform designed in this way, and it is prevented that the copy of CD is copied unjustly.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing distribution of the block reproduced when the sub-code Q field which is not regular is accessed with a CD-ROM regenerative apparatus.

[Drawing 2] It is drawing showing distribution of the block reproduced when the sub-code Q field of normal is accessed with a CD-ROM regenerative apparatus.

[Drawing 3] It is the flow chart which shows the process which reproduces CD by which anti-copying was carried out in the changed sub-code Q field.

[Drawing 4] It is the flow chart which shows actuation when the protected application and the protected disk are performed by computer.

[Drawing 5] It is drawing showing the pattern of the pit which is formed in a nickel master and is behind embossed by a polycarbonate or the PMMA substrate, and a land.

[Drawing 6] It is a mimetic diagram for explaining the principle which reads data from CD.

[Drawing 7] It is drawing showing a format of the data sector in the mode 1 of Standard C D-ROM.

[Drawing 8] It is drawing showing the structure of the CD-ROM data encoded by CD.

[Drawing 9] It is drawing showing the 98-bit detailed layout of the sub-code Q field.